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PRECAUTIONS AGAINST POISONING BY JOHNSON GRASS AND OTHER SORGHUMS

By C. M. HARING

For many years it has been recognized that *green* sorghums, when stunted or in the stage known as "second growth," may sometimes be poisonous to stock. In California losses of cattle and sheep from Johnson grass poisoning are frequent, but complaints of poisoning from sorghums are rare. The danger from poisoning by members of the sorghum family, with the exception of Johnson grass, has doubtlessly been overestimated, as the death rate among live stock from this source is low compared with that from other causes.

The poisonous property of all the sorghums is due to hydrocyanic acid, popularly known as prussic acid. Fortunately, this compound forms only under certain conditions of growth and moisture and is confined to the green leaves. The following varieties, when green, may contain enough of this poison to cause death in stock: *Johnson grass, Sudan grass, sweet sorghum,* and *kafir.* All varieties are said to develop hydrocyanic acid occasionally. When young and green, or when stunted, the following forage plants should also be fed with caution: *milo, feterita, kaoliang, dura* or *Egyptian corn,* and *shallu* or *Mexican wheat.* Some plants, not belonging to the sorghum family, notably Java beans, Burma beans, and cherry tree leaves, contain a dangerous amount of hydrocyanic acid.

Johnson Grass (*Andropogon halepensis*).—This plant is well known to farmers in California. It was introduced a number of years ago and cultivated as a forage plant, but it soon escaped and assumed the character of a weed. It has become a pest in nearly all irrigated districts of the state. Johnson grass closely resembles Sudan grass in appearance, the leafage being practically the same, but the latter is an annual and easily eradicated, while the former is a perennial with underground root stocks which are extremely difficult

to kill. Any portion of these root stocks, when separated from the parent plant, even if only an inch or so in length, is capable of producing new plants. The root stocks are succulent and lose their moisture very slowly so that it is difficult to kill them even by exposure to drought.

Johnson grass may serve as forage for cattle and sheep, but under certain conditions, which as yet are not well understood, it may become poisonous. For many years there have been occasional reports of Johnson-grass poisoning in California. This season (1917) stock losses from this cause have been numerous and several samples submitted for analysis have been found to contain hydrocyanic acid.

Symptoms and Diagnosis.—Hydrocyanic acid has the most rapidly fatal action of any known poison. There are several vegetable alkaloids which are more poisonous in proportion to their volume and weight, but their lethal action is more prolonged. Instantaneous death results from a very small amount of the free acid placed on the tongue. In dilute form or when contained in sorghum small quantities will cause severe symptoms in a few seconds. The animal staggers or falls, the eyes are motionless, the heart action is slowed, and the respirations are slow and convulsive. All animals are sensitive to prussic acid, but sorghum poisoning occurs chiefly in cattle and sheep. Glover and Robbins of the Colorado Experiment Station report that a cow died in ten minutes after eating a few mouthfuls of poisonous kafir corn. It is said that if an animal lives thirty minutes after the first symptoms develop it stands a good chance of recovery.

In non-fatal cases the symptoms observed have varied from slight signs of vertigo and cessation of rumination to severe convulsions. In cattle and sheep bloating may occur as a secondary effect. Recovery is rapid and most animals that recover appear normal the following day, but in some instances cattle show weakness and a staggering gait for several days.

Autopsy of cattle or sheep that have died from poisoning by Johnson grass or other sorghums seldom shows anything characteristic. The diagnosis must be based on the history of the case and the demonstration by chemical analysis of the presence of prussic acid in the forage.

Specimens for Laboratory Analysis.—The analysis of the stomach contents or tissues is not practicable because of the rapid disappearance of the poison. On the other hand, a chemical analysis of the suspected sorghum is often the only way to arrive at a positive diagnosis. If animals have died and the sorghum forage is suspected, a chemical examination to determine the edibility of the remaining crop

will be in order. It is useless to submit specimens if the entire crop has been consumed. The College of Agriculture of the University of California is prepared to analyze specimens on certain conditions. Samples should be accompanied by a full description so that the University may judge whether the circumstances justify the service. Specimen plants for analysis should be selected from several different places in the field, as all of the plants may not contain the poison. Collect only the leaves and green stalks, wrap them tightly in paper, pack in a tight tin box, and forward promptly by parcel post or prepaid express.

Precautions by Which to Avoid Conditions Under Which Poisoning May Occur.—The forage is not likely to prove dangerous when grown with an ample supply of moisture. *No losses have been reported from feeding grain heads, silage, dry fodder, or stover.*

If it becomes necessary to pasture stock on sorghums which are suspected to be in the dangerous stage, the crop had better be cut and air-dried before being fed to stock, or it may be made into silage. Another plan is to test it first by turning in an animal of inferior value. If it refuses to eat, it is probable that the plants are not safe. Hungry stock are, of course, much more liable to be fatally poisoned than those given some feed previous to turning into the field.

The fact that losses have occurred does not justify the condemnation of the sorghums as a stock food. Further losses may be avoided by a little care. No sorghum fodder should be destroyed, even if proved to contain prussic acid, since further growth and drying may render the vegetation harmless, and it can at any rate be rendered harmless by being made into hay or silage.

Treatment.—The rapid action of prussic acid often gives no time for treatment, but in cases of poisoning due to the presence of prussic acid in the forage the symptoms do not develop so quickly as with the free acid and efforts to relieve the animals may be of some value. Cattle or sheep which are down in the hot sun should be protected by an improvised shade. If the ground is sloping, the head should be turned up hill, care being taken not to interfere in any way with respiration. When bloating occurs, it should be relieved by puncturing the paunch with a trocar and canula, or a sharp knife, thrust through the left side at a point a hand's breadth in front of the hip bone.

The subcutaneous administration of atropine sulphate and other stimulants in doses suited to the size and species of the animal is recommended. Inhalations of ammonia may also be used for the same purpose.

Hydrogen peroxide has been recommended by toxicologists as an

antidote. The dose for a cow should be at least a pint mixed with an equal quantity of water.

In cyanide plants and gold mines, using the cyanide process, it is customary to keep on hand prussic-acid antidote outfits for human use, consisting of two reagent bottles and a drinking glass. Any stock owner can prepare at small expense a similar outfit for use on farm animals.

Directions for Preparing Johnson-Grass Antidote Outfit:

Bottle No. 1.—Select a strong bottle of at least a quart capacity, having a long neck suitable for use in drenching cattle. Place in this bottle one pint of water and one ounce of sodium carbonate. (Ordinary washing soda will do.) Keep tightly corked.

Bottle No. 2.—This should contain one-half ounce of iron sulphate (copperas) dissolved in a pint of water. Keep tightly corked.

Directions for Use of the Antidote Outfit.—When needed, pour the contents of Bottle No. 2 into Bottle No. 1, shake and administer immediately. A cow should receive the entire quart of mixture. For a sheep one-half pint of the mixture would be sufficient. This antidote would be valuable also for cases of Paris green or other arsenical poisoning. In case it seems desirable to have enough antidote on hand for several head of cattle, larger amounts of the solutions may be stored in demijohns or large glass carboys, but *not in metal* containers. When needed, empty both reagents into a pail and administer to each animal from the mixture.

Attempts to administer the drenches should be cautious to avoid choking, as the animal may be unable to swallow. The antidote may be given to cattle and sheep through a canula inserted into the paunch through the left side in the manner used for relieving bloat.

Glucose, corn syrup, and molasses are said to be beneficial to cattle in case of prussic-acid poisoning and may be given in large quantities. Their administration, however, should not take preference over the antidotes previously mentioned.